

SURVEILLANCE AND MONITORING

CDC Releases Updated Biomonitoring Report

Biomonitoring—the science of measuring environmental chemicals in human blood, urine, and other tissues—made another modest advance with the 10 December 2009 release of the *Fourth National Report on Human Exposure to Environmental Chemicals* by the Centers for Disease Control and Prevention (CDC). The report includes data on 75 substances not in the preceding report, for a total of 212 reported chemicals. Data for more than 45 additional pesticides and metabolites are expected to begin appearing on the CDC website (<http://www.cdc.gov/exposurereport/>) by spring 2010.

This is almost a 10-fold increase over the 27 substances covered in the initial report in 2001, greatly expanding the data researchers can use in their continuing efforts to take the next step—determining what the reported concentrations mean from a health risk perspective. “Interpretation is key to making biomonitoring data more meaningful,” says Sarah Brozena, senior director for regulatory and technical affairs with the American Chemistry Council. Yet such understanding is extremely limited so far for most chemicals.

But the science of biomonitoring may be nearing a short-term zenith for the number of substances assessed in the general population, and future CDC reports “will probably grow less than [they] have recently,” says John Osterloh, chief medical officer and toxicologist with the CDC Division of Laboratory Sciences. That’s due to technological limitations as well as capacity and budget constraints. As a result, in the foreseeable future it’s likely that data for only a tiny fraction of the 239,000 toxic substances listed by the Chemical Abstract Service as regulated or included in inventories worldwide would be included in biomonitoring efforts.

The report draws on data from the National Health and Nutrition Examination Survey, an ongoing survey that every 2 years samples a small number of people intended to represent the U.S. general population. Chemicals included in the fourth report

have been selected on the basis of likelihood of exposure in the U.S. population, seriousness of known or suspected health effects resulting from exposure, and availability of appropriate ways to measure the chemical, among other factors. Of the samples assessed, 90–100% had detectable levels of substances such as perchlorate, mercury, bisphenol A, acrylamide, multiple perfluorinated chemicals, and the flame retardant BDE-47.

Osterloh knows of no breakthrough technologies that can substantially expand the CDC biomonitoring program. One option could be to have industries generating chemicals conduct such testing—a suggestion that could be presented in future legislative proposals or efforts to revise the Toxic Substances Control Act. In the meantime, biomonitoring programs in state public health laboratories, Canada, and Europe offer no near-term prospects for covering substantially more substances.

Another important limitation of the CDC’s current effort is that it covers just one substance at a time. “In the real world, we’re exposed to mixtures,” says Anila Jacob, a senior scientist with the Environmental Working Group, an advocacy organization that has documented 414 substances in 186 people it has tested, many of whom carry scores of contaminants. While Osterloh acknowledges concerns about the combined effects of chemicals, he says the CDC’s current program isn’t designed to address mixtures. However, he adds the CDC plans to evaluate mixtures for some chemicals, such as the dioxin-like chemicals, in separate scientific endeavors.

The current CDC biomonitoring methodology is not designed to assess geographic differences in exposure, nor can it be used to assess fetal contamination. The latter is a particular concern for Jacob, whose team found up to 232 contaminants in a recent study of cord blood from 10 newborns. “The developing fetus is one of the most vulnerable populations out there,” she says. However, a pilot study of cord blood from infants born to 525 women that is on tap as part of the blossoming National Children’s Study (of which CDC is a part) could begin to help remedy this shortcoming.

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The Beat by Erin E. Dooley

Highway Barriers Muffle Pollution

Along many heavily traveled U.S. highways stand high barriers constructed to keep traffic sights and sounds from nearby residents. An EPA/NOAA study in volume 44, issue 2 (2010) of *Atmospheric Environment* found the barriers



Highway barriers may contain pollutants as well as noise.

may also help prevent air pollutants from reaching neighborhoods. The team used tracers under several different atmospheric conditions to measure the movement of pollutants such as carbon monoxide, heavy metals, and volatile organic compounds. Barriers tended to disperse or channel pollutants away from nearby areas or, in some circumstances, trap pollutants in the roadway. The authors say keeping traffic pollutants from populated areas could help reduce the incidence of respiratory illnesses, cardiovascular effects, and some cancers.

Where There’s Smoke Flavoring...

Smoke flavorings are used in a variety of meats, cheeses, soups, sauces, and other foods. In January 2010 the European Food Safety Authority released the results of a review showing that intake levels of 8 such flavorings may be high enough to approach levels that can cause adverse effects—although margins of safety typically overestimate intake levels. For 1 flavoring, the beech wood–derived compound AM 01, the panel could not rule out possible genotoxicity given data provided by

the manufacturer. The European Commission will use the review findings to help revise the list of approved smoke flavorings.

Methylation and Mental Retardation

Paul Greengard and colleagues report in the 10 December 2009 issue of *Neuron* that improper functioning of the protein complex GLP/G9a is linked in mice to a mental retardation–like effect known as 9q34 syndrome. GLP/G9a plays a key role in epigenetic gene silencing during normal neural development. “[I]t is conceivable,” the authors write, “that mental retardation is triggered not by changes in specific target gene(s), but by the inability of neurons to respond adequately to environmental signals under conditions of greatly distorted transcriptional homeostasis.”

Children and Smokers: The Hazard without the Habit

In the 1 January 2010 issue of the *American Journal of Epidemiology*, Gina Lovasi and colleagues report that adults exposed to

REMEDIATION

A Break in the Clouds: Rebuilding New Orleans

Rebuilding housing in New Orleans after Hurricane Katrina has involved a massive cleanup effort: removal of millions of tons of debris, thousands of potentially hazardous appliances, and tons of hazardous waste along with consideration of underground storage tanks, Superfund sites, and disabled drinking water systems. Now nonprofit groups involved in the rebuilding effort in the city's hardest-hit neighborhoods, including the Lower Ninth Ward, are working to ensure new homes are built on safe sites, and their efforts are starting to pay off.

After Katrina struck in August 2005, more than half of New Orleans' homes sat for days or weeks in up to 6 feet of floodwater. Environmental damage was severe, inside and out; one study published in the December 2006 issue of *EHP* found interior mold and endotoxin levels similar to agricultural environments. Citywide, thousands of houses were demolished. [For more information on the hurricane's environmental health sequelae, see "In Katrina's Wake," *EHP* 114:A32–A39 (2006).]

The New Orleans Office of Community Development has worked with nonprofit builders to restore neighborhoods with a view to environmental health and justice. One group, the Make It Right Foundation, was established in 2007 to build homes in the city's most impoverished neighborhoods. The foundation's goal, says executive director Tom Darden, is 150 new energy-efficient homes built with low-toxicity materials, each priced under \$150,000.

To start, Make It Right assessed the neighborhood's environmental conditions with analyses from the U.S. Environmental Protection Agency (EPA) and the Tulane/Xavier Center for Bioenvironmental Research. Howard Mielke, a research professor at the center, had mapped the city's soils before Katrina using a high-density sampling protocol, including collection of more than 5,000 samples across the city between 1998 and 2000. The main hazard he found, as reported in the December 2008 issue of *Environmental Geochemistry and Health*, was soil lead—up to 1,700 ppm in some locations. This

so-called legacy contamination came from old lead-based paint as well as decades of residue from leaded gasoline and other sources, similar to other cities. In other neighborhoods Mielke still finds lead levels of 1,000–1,700 ppm. "Kids are playing in this stuff," he says. [For more information on legacy lead contamination, see "Lead in Air: Adjusting to a New Standard," p. A76 this issue.]

Make It Right settled on small-scale housing on a 14-block area where the main hazard found was high soil lead (around 200 ppm, or half the EPA remediation threshold for play areas of 400 ppm). Adopting guidelines proposed in a paper Mielke co-authored in the 15 April 2006 issue of *Environmental Science & Technology*, Make It Right and another nonprofit, Global Green, added a clean 6- to 12-inch layer of river alluvium and landscaping to remediate the soil. Although the lead and other heavy metal contaminants were well below action levels, says Darden, the foundation made a policy of doubling the recommended depth of added clean soil "to be on the safe side."

Blocks of buildings in the part of the Lower Ninth Ward where Make It Right focused were reduced to bare concrete slabs by the spring of 2007 when they broke ground for rebuilding. The builders ground up concrete demolition waste, Darden says, and recycled it onsite into stormwater retention boxes, driveways, and stone gardens. By focusing on new home construction, Make It Right obviated the need to remediate interiors. They examined all building materials for low emissions and optimal recyclability. That included using structurally insulated panels made of wood and high-density insulation foam for less moisture absorption than gypsum-based drywall.

By mid-December 2009, the foundation had completed 16 houses, all of which have been occupied. Another 20 are under construction, and there are plans to break ground on 10 more in coming months.

Mielke says other cities should follow New Orleans' model of soil testing and cleanup. "Every city in the country needs to be mapped really well." Of the lead-contaminated soil he adds, "You can find it in any city today, and it has major impact on children's health."

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secondhand smoke in childhood may have a higher risk of emphysema-like lung damage even if they themselves never smoke. Adult participants of the MESA–Lung Study who reported living with 2 or more smokers as children were more likely to show damage on CT scans than participants who had lived with 1 or no smokers. Emphysema and chronic obstructive pulmonary disease, combined, are projected by the WHO to become the third leading cause of death worldwide by 2020.



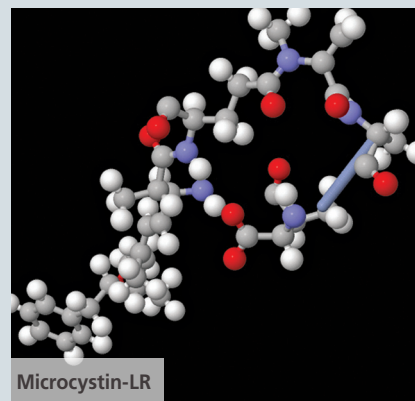
Living with multiple smokers may increase children's risk of lung damage later even if they themselves never smoke.

Nanotubes Detect Toxins in Water

In the December 2009 issue of *Nano Letters* Nicholas Kotov and colleagues describe a new biosensor that can rapidly detect microcystin-LR (MC-LR) in drinking water. Even small amounts of MC-LR, a peptide produced by blue-green algae, can cause liver damage and cancer, but current water treatment methods cannot always completely remove the toxin. The new biosensor consists of a paper strip containing carbon nanotubes impregnated with antibodies for MC-LR. It performs 28 times faster than the method currently used most often and produces results in less than 15 minutes. Developer Nicholas Kotov says additional toxins can be tested using their corresponding antibodies.

Parents Take On Toy Testing

On 18 December 2009 the Consumer Product Safety Commission extended a stay of enforcement on testing for certain categories of children's goods for up to 8 months. The extension is intended in part to work out the implementation kinks in a testing and third-party certification program originally approved



in 2008. Meanwhile, even as stores scramble to remove toxic cadmium-bearing children's jewelry from shelves, parents are taking toy safety testing into their own hands through the use of hand-held X-ray fluorescence analyzers. These devices can detect lead, cadmium, and other toxic metals in consumer products. Some health advocacy groups are purchasing the costly devices and offering their services to concerned parents during free testing events or for a fee; in some areas, the devices can also be rented.